

How Reform Has Changed Agricultural Production, Consumption, and Trade

Since reform began in the late 1980s and early 1990s, agriculture in most transition economies has experienced major commodity restructuring—that is, major changes in the commodity mix and volume of agricultural production, consumption, and trade. The main feature of the restructuring has been a substantial drop in agricultural production, especially in the livestock sector (table 1).^{3,4} The data in the table are based on countries' official production numbers, which exaggerate the decline in output. In the pre-reform period, farms often overstated their production to look better with respect to output target performance. In the transition period, farms have an incentive to understate production to avoid taxes and buttress their arguments for more state support. The difficulty of measuring the growing output by private farmers and the informal sector increases the likelihood of undercounting transition production. Yet, even if not wholly accurate, the official numbers clearly

³ The exceptions are Uzbekistan and Turkmenistan, whose experiences are examined later in this report.

⁴ For data on agricultural production and trade, as well as analysis of key issues involving specific countries' agriculture, see the briefing rooms on Hungary, Poland, Russia, and Ukraine at the ERS Web site www.ers.usda.gov

show a large decline in output. The downsizing of the agricultural sector has also coincided with a major drop in consumption of livestock products (table 2).⁵

The drop in agricultural production has been part of an economy-wide decline in output (table 1). In most transition economies, industry has also contracted substantially (especially heavy industry), and gross domestic product (GDP) is also down in most. As with agriculture, the decline in output in industry and in GDP as indicated by the table is overstated. For largely the same reasons given for agriculture, the official output numbers for industry on which the table figures are based exaggerate the drop. The GDP figures are probably more downwardly biased than those for agriculture and industry. The fastest growing sectors in GDP involve services (everything from hair styling to legal work), which either did not exist during the socialist period or were severely underrepresented in official macroeconomic accounts. Because growth in services is hard to measure, these sectors are underrepresented in countries' GDP accounts.

⁵ A recent ERS study (Cochrane, 2002) focuses on how reform in the transition economies has restructured the livestock sector. The report examines how reform has reduced the production and consumption of livestock products, as well as generated institutional change within the sector, as illustrated by a number of case studies. The report also uses a simulation model to forecast how various reform and policy developments, such as reducing subsidies to agriculture and creating land markets, would affect livestock production, consumption, and trade.

Table 1—Agricultural and industrial production and GDP all fall

Countries	Index of change in production				
	Grain	Meat	Agriculture	Industry	GDP
Hungary	88	65	72	112	98
Czech Republic ¹	87	73	72	86	91
Poland	99	98	92	108	122
Romania	93	76	97	68	75
Bulgaria	68	50	59	50	68
Russia	61	48	60	50	61
Ukraine	61	41	51	39	39
Kazakstan	46	45	47	44	51
Belarus	73	57	58	96	71
Uzbekistan	246	108	99	72	97
Turkmenistan	335	126	118	45	90

Note: The indices give average annual output for 1997-99 relative to average annual output for 1986-90, with 1986-90 = 100. For example, the index of 72 for agriculture for Hungary means that total agricultural output in Hungary for 1997-99 equaled 72 percent of output for 1986-90. All changes are in volume (or real) terms.

¹ For grain and meat, the indices cover the Czech and Slovak Republics combined.

Source: USDA, OECD, and PlanEcon.

Table 2—Per capita consumption of foodstuffs

Foodstuff	1990								
	Poland	Hungary	Romania	Russia	Ukraine	United States	Germany	Great Britain	Japan
	<i>Kilograms</i>								
Meat	73	101	74	75	68	113	96	72	38
Milk (excluding butter)	230	178	99	184 ¹	184 ¹	256	224	227	65
Cereals	145	148	173	164 ¹	164 ¹	109	94	93	133
Potatoes	144	58	59	106	131	55	81	105	25

Foodstuff	1997								
	Poland	Hungary	Romania	Russia	Ukraine	United States	Germany	Great Britain	Japan
	<i>Kilograms</i>								
Meat	66	84	50	48	32	117	83	73	42
Milk (excluding butter)	204	156	179	145	156	254	236	234	68
Cereals	157	113	205	156	160	116	83	95	118
Potatoes	136	66	82	125	126	62	79	113	26

¹ Figure for entire USSR.

Source: FAO.

The main reason agricultural and industrial output and GDP have fallen in most transition economies is that consumers' desires for goods have replaced planners' preferences as the dominant force in determining what goods are produced, consumed, and traded. The contraction and commodity restructuring of transition agriculture has therefore been an inevitable part of market reform. To examine the downsizing of agriculture, one must first explore certain features of the pre-reform agricultural economy.

The Pre-Reform Agriculture and Food Economy

In the late 1960s, the leadership of the USSR decided to increase production of livestock goods, a policy the Eastern European countries of the Soviet bloc generally followed. Consequently, from 1970 to 1990, livestock herds and output in these countries grew by 40-60 percent (for example, 63 percent in the USSR, 43 percent in Poland, and 57 percent in Hungary). The rise in feed requirements caused by the growing herds stimulated the crop sector. In the late 1980s, the average annual output of feed grain in the USSR and Poland was up by about half compared with output in the late 1960s, and in Hungary the rise was about one-quarter. The feed requirements of the USSR were so great that the country also became a substantial

importer of grain, soybeans, and soybean meal, much of it from the United States (table 3).

By 1990, per capita consumption of livestock products and foodstuffs in general in transition economies compared favorably with levels in many OECD nations (table 2). Because per capita GDP in the USSR and Eastern Europe was at most only half the OECD average, these countries were producing and consuming high-cost livestock products at a much higher volume than one would expect based on the countries' real income. This "achievement" came at a price, as large state subsidies, to both producers and consumers, were necessary to maintain the high levels of production and consumption. For example, by 1990 direct budget subsidies to the agriculture and food economy were about 10 percent of GDP in the USSR and between 5 and 10 percent of GDP in most Eastern European countries. The bulk of the subsidies went to the livestock sector.

Supply and demand analysis can be used to show how market reform has changed agricultural production, consumption, and trade in transition agriculture, with special emphasis on the contraction of the livestock sector. Figure 1 identifies the "market" for a typical agricultural good in a transition economy before reform. S^1 is the supply curve and D^1 is the

Table 3—Agricultural imports by the former USSR change dramatically

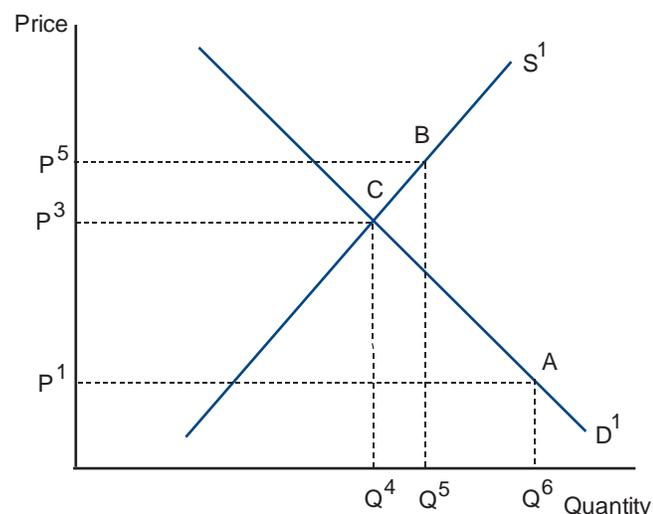
Commodity	1986-90	1995-98
	<i>Thousand tons</i>	
Total imports		
Grain	33,140	2,150
Soybeans and soybean meal ¹	4,500	850
Meat	868	1,970
Imports from United States		
Grain	13,700	660
Soybeans and soybean meal ¹	1,720	160
Meat	30	1,200

Note: Figures give average annual values over the period. Imports for 1995-98 are from countries beyond the region of the former USSR.

¹In soybean equivalent.

Source: USDA.

**Figure 1
Price liberalization within a single market**



Note: Identification of price (P) and quantity (Q) values:

- P¹ is the pre-reform consumer price.
- P³ is the producer and consumer price after price liberalization within this market alone.
- P⁵ is the pre-reform producer price.
- Q⁴ is the quantity of production and consumption after price liberalization within this market alone.
- Q⁵ is the pre-reform quantity of production.
- Q⁶ is the pre-reform quantity demanded by consumers.

Source: ERS.

demand curve. The state set prices for both producers and consumers. Producers receive a price of P⁵, which motivates them to produce Q⁵.⁶ The consumer price is P¹, such that consumers wish to buy Q⁶. However, consumers must settle for the actual level of production Q⁵.

In the transition economies, pre-reform producer prices for agricultural goods typically exceeded consumer prices. Thus, the producer price P⁵ in figure 1 is greater than the consumer price P¹. Figure 2 gives the ratio of pre-reform producer prices to consumer prices for agricultural goods for various transition economies.⁷ Government budget subsidies were necessary to cover the gap, with the difference between producer and consumer prices indicating how large the subsidies had to be. For example, the ratio of producer to consumer prices in Poland in 1986 was about 1.8; that is, budget subsidies alone to the agriculture and food economy equaled about 80 percent of all consumer expenditure on agricultural goods.

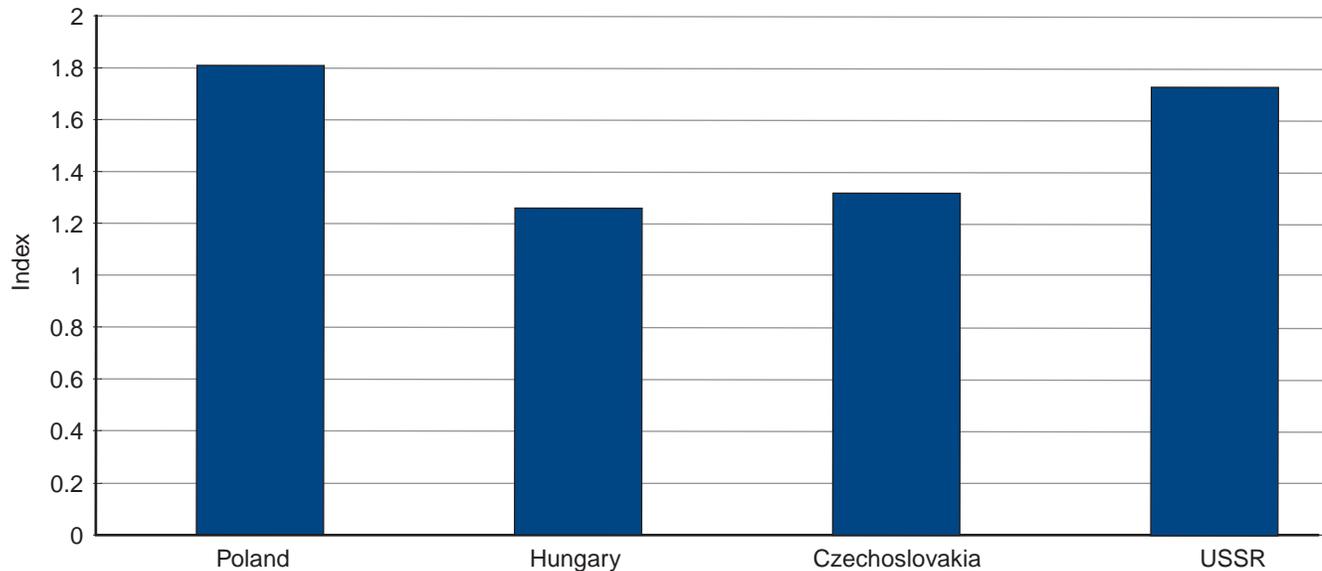
Another feature of the pre-reform food economy in transition economies was that consumer prices for foodstuffs were set so low that output could not satisfy the demand generated by the prices. In figure 1, this effect results in a market shortage of the good, or excess demand, equal to Q⁵Q⁶. In the pre-reform period, long lines of shoppers and food stores with empty shelves were commonly interpreted in both the Soviet bloc countries and the West as signs of major food shortages. Low state-set consumer prices that overly stimulated demand, however, were the main cause of these “market” shortages, rather than inade-

⁶ One can argue that in most pre-reform countries of the Soviet bloc, markets did not really exist for agricultural goods on the supply side, which means a market supply curve did not exist. Producers did not freely determine their output in response to prices. Rather, they were given an output target, which they sold to the state at the state-determined price. With respect to figure 1, Q⁵ would be the economy-wide output target for the good in question. The pre-reform supply curve is therefore really the economy-wide marginal cost of production curve for the good. P⁵ identifies the per unit full cost of producing the last units of output needed to reach the total output level of Q⁵.

⁷ The producer prices used in figure 2 are in fact full *producer incentive prices*. They equal the actual monetary prices producers received plus budget subsidies per unit of output. The incentive price of P⁵ gives the full “price” that producers in a market economy must receive to produce Q⁵ of output.

Figure 2

Ratios of producer to consumer prices for agricultural goods in 1986



Source: Computed from ERS (1994).

quate supplies of foodstuffs in any material sense (as the inter-country comparison of consumption in table 2 shows).

Price Liberalization

The lead policy of economic reform in the transition economies was price liberalization, which involved the corollary policy of reducing or eliminating state budget subsidies needed to maintain gaps between prices paid to producers and prices charged to consumers. In figure 1, the immediate effect of freeing prices and eliminating budget subsidies for the good in question is that both the producer and consumer price move to P^3 . (S^1 , the marginal cost of production curve, now becomes the market supply curve.) Production and consumption fall from Q^5 to the market clearing level of Q^4 .

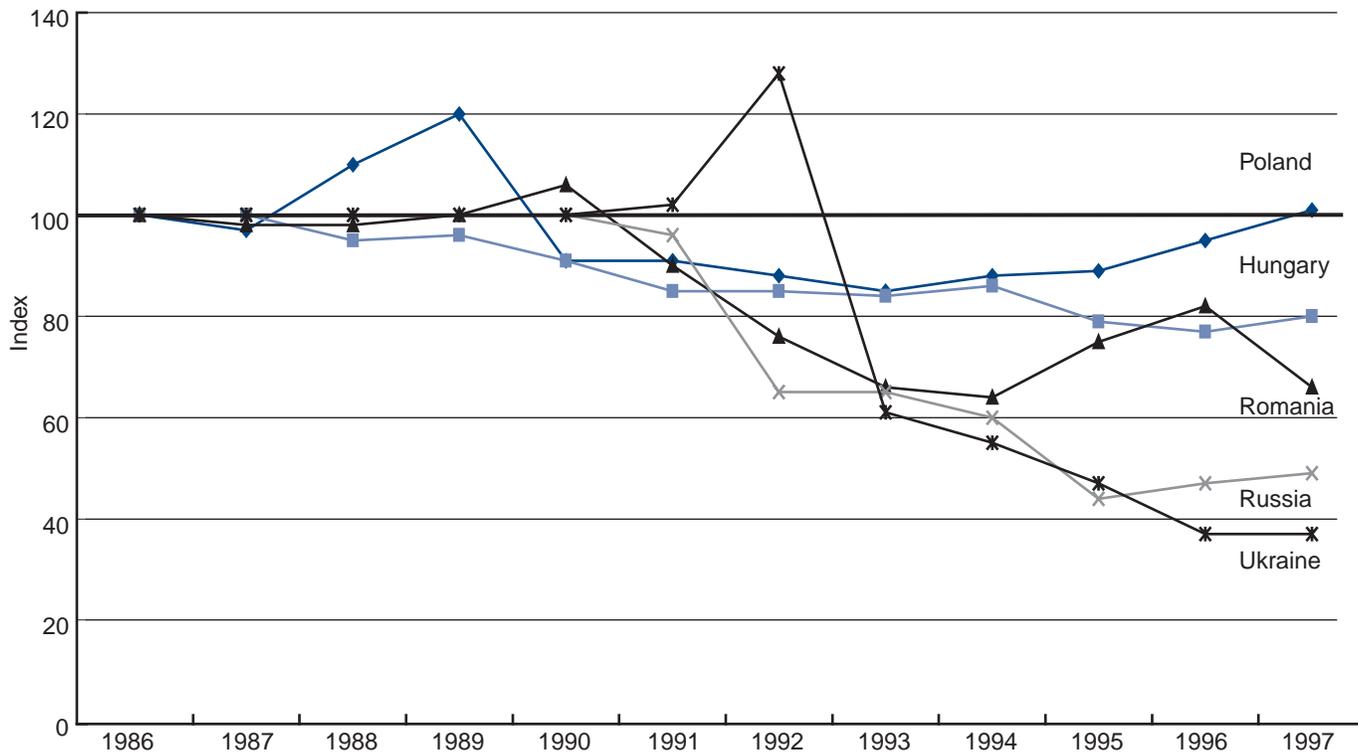
The drop in output from Q^5 to Q^4 measures the effect of reform on production from liberalizing the market for only this particular good. However, price liberalization had two other major effects on markets for agricultural products. The freeing of prices led to high economy-wide inflation, in most countries in the hundreds (and in some cases thousands) of percent annually in the early reform years. The massive inflation substantially reduced consumers' real income and, correspondingly, purchasing power, as prices economy-wide rose by a greater percentage than wages and salaries (fig. 3). The decline was particularly severe in Russia and

Ukraine, where real incomes fell during the 1990s by half or more. The decrease reflects not only the drop in pay for workers who kept their jobs, but also the rise in unemployment during the transition period.

The fall in real income reduced demand for foodstuffs, represented in figure 4 by the shift left in the demand curve from D^1 to D^2 (figure 4 reproduces and adds to figure 1). The drop in demand decreases both production and consumption from Q^4 to Q^3 . The degree to which demand falls for a particular foodstuff depends on how sensitive demand is to changes in income (the income elasticity of demand). Among foodstuffs, demand for livestock products is relatively sensitive to changes in income (*income elastic*), such that declining income in the transition economies particularly hurt the livestock sector. The downsizing of the livestock sector also lowered demand for animal feed (feed grains and oilseeds), and thereby hurt those markets. This effect, rather than the drop in human demand for grain and oilseed products because of falling real income, accounted for most of the reform-driven shift to the left in the demand curves for these crops.

For certain foods, such as bread and potatoes, demand can rise rather than fall when income decreases (*inferior goods*). In figure 4, this would shift the demand curve right. During the transition, consumption of cereals and potatoes in some countries has risen, suggesting that for these countries the products might in fact be inferior goods (table 2).

Figure 3
Consumers' real income falls



Note: For Poland, Hungary, and Romania, figure begins in 1986, with 1986 = 100. For Russia and Ukraine, figure begins in 1990, with 1990 = 100.

Source: PlanEcon.

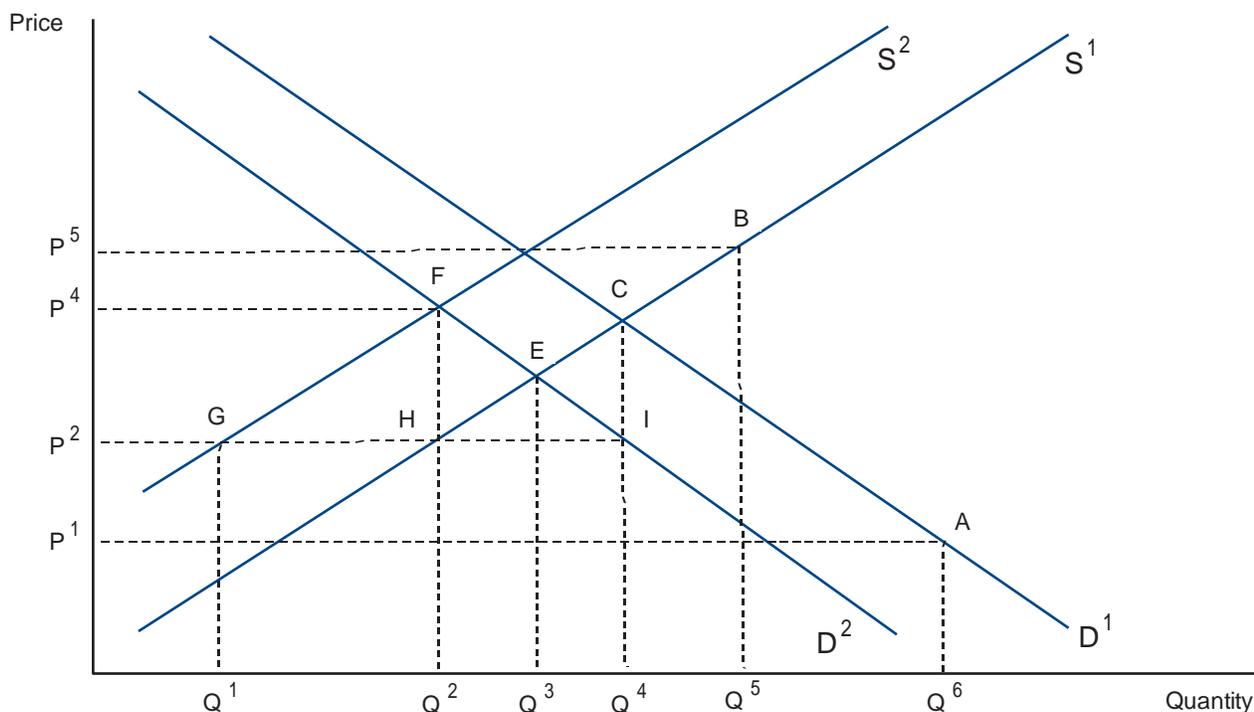
In addition to this demand-side effect, price liberalization also affected the supply side of the market by raising the real prices for agricultural inputs. In the inflation that followed price liberalization, prices for agricultural inputs rose by a much greater percentage than prices for agricultural output. This effect increased the real prices producers had to pay for inputs, or in other words, worsened *producers' terms of trade* (fig. 5). In most CEECs, such as Poland, Hungary, and Romania, agricultural producers' terms of trade have dropped by 30-60 percent, while in Russia and Ukraine they have deteriorated by about 75 percent. In 1992, Russian wheat producers on average had to sell 0.3 tons of output to purchase 1 ton of nitrogen fertilizer. In 1997, they had to sell 1.4 tons of wheat to buy the same amount of input (Russian Federation, 1998).

The rise in input prices increases producers' per unit costs of production. This effect is represented in figure 4 by the leftward shift in the supply curve from S^1 to S^2 .

The shift in supply cuts production and consumption further to Q^2 . (To avoid cluttering figure 4, Q^2 is used to represent two different quantities—the level of production and consumption after economy-wide price liberalization referred to in this paragraph, associated with point F, and the quantity of production after price and trade liberalization within this market alone, associated with point H, which is discussed later. These two quantities would usually be different.) The drop in output occurs because higher real prices for inputs result in reduced use in production. For example, from 1990 to 1997, Russian fertilizer use per hectare fell 80 percent, from 88 to 16 kilograms (Russian Federation, 2000).

Price liberalization could result in input prices rising relative to output prices for two reasons. The first is that in the pre-reform period, prices for inputs were set lower relative to their production cost than were prices for output. When prices were then freed, prices for inputs had to rise more than prices for output to reach the value of the real cost of production. Such

Figure 4
Price and trade liberalization



Note: Identification of price (P) and quantity (Q) values:

P^1 is the pre-reform consumer price.

P^2 is the producer and consumer price after price and trade liberalization.

P^4 is the producer and consumer price after economy-wide price liberalization.

P^5 is the pre-reform producer price.

Q^1 is the quantity of production after price and trade liberalization.

Q^2 is the quantity of production and consumption after economy-wide price liberalization; it also is the quantity of production after price and trade liberalization within this market alone. Q^2 is used to represent two different values simply to avoid cluttering the figure.

Q^3 is the quantity of production and consumption after both price liberalization within this market alone and the drop in consumer demand from declining real income following economy-wide price liberalization.

Q^4 is the quantity of production and consumption after price liberalization within this market alone; it also is the quantity of consumption after price and trade liberalization. Q^4 is used to represent two different values simply to avoid cluttering the figure.

Q^5 is the pre-reform quantity of production.

Q^6 is the pre-reform quantity demanded by consumers.

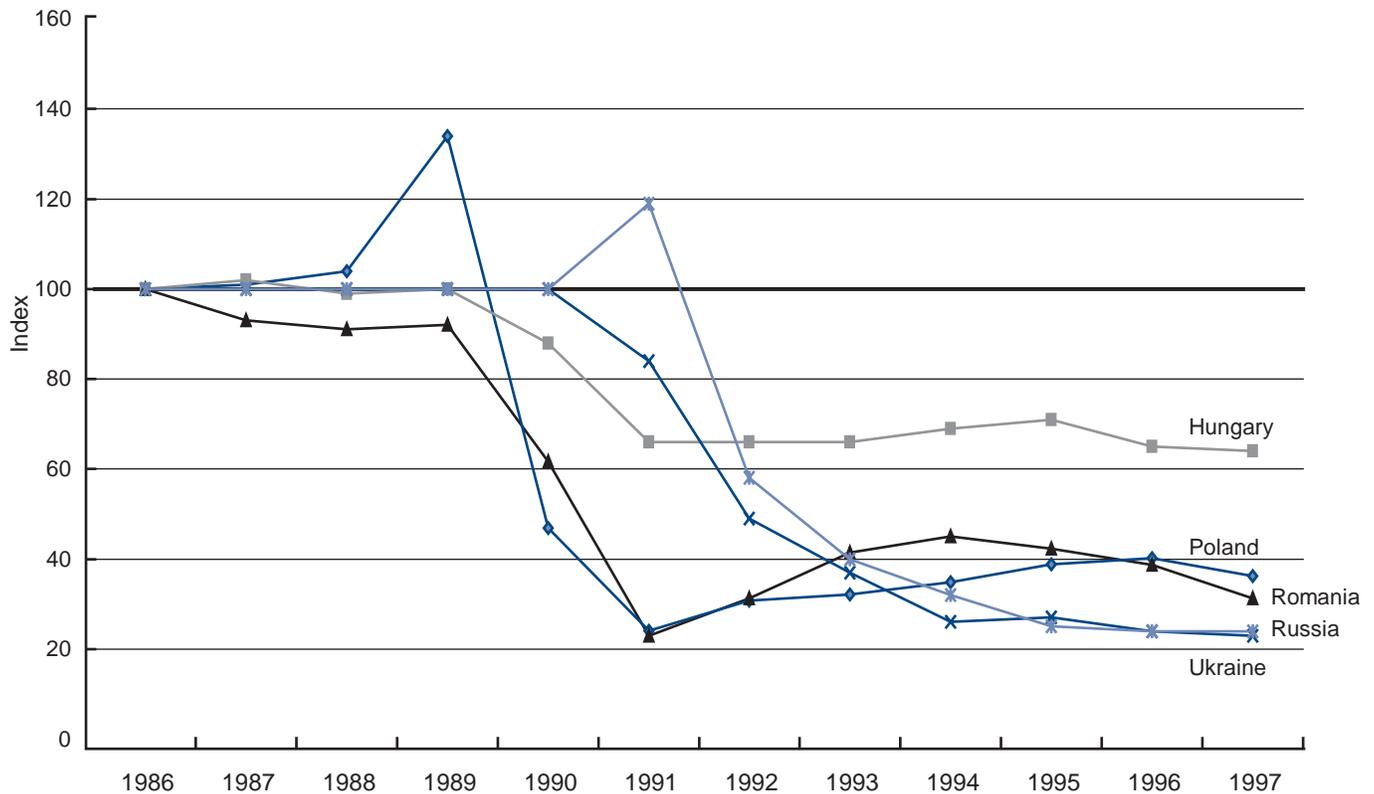
Source: ERS.

price-setting behavior means that in the pre-reform period, producers were subsidized not only through direct budget subsidies, but also indirectly through the price system.

The second possible reason input prices could rise relative to output prices involves not only market liberalization but also the market structure for suppliers of agricultural inputs. In the pre-reform period, farms were typically dependent for the supply of any particular

input on just a few, and perhaps only one, large state distributor(s). During the early reform years, markets in most transition economies were liberalized and the input distributors privatized without the latter being broken up into smaller competing units. During the transition period, farms have accused the large suppliers of using their monopoly-type market power inherited from the old system to charge higher prices than would be possible if a number of smaller competitive suppliers existed, prices that exceed the input producers' costs of

Figure 5
Agricultural producers' terms of trade deteriorate



Note: The index values identify the change in the prices agricultural producers received for their output relative to the change in the prices producers paid for inputs. For Poland, Hungary, and Romania, the figure begins in 1986, with 1986 = 100. For Russia and Ukraine, the figure begins in 1990, with 1990 = 100.

Source: OECD.

production. Higher input prices raise farms' production costs. In figure 4, such pricing behavior would contribute to the leftward shift in the supply curve from S^1 to S^2 .

Although common to most transition economies, this problem is hard to gauge. In most NIS countries, such as Russia and Ukraine, local authorities continue to help the large former state and collective farms obtain inputs, often at below-market prices, in return for the farms' willingness to sell the authorities a certain amount of output at agreed-upon prices. Because the prices of both inputs and output exchanged in these deals often deviate from existing "market" prices, it is difficult to determine whether farms are on net gaining or losing from the arrangement. Given that NIS regional governments have been paternalistic toward farms in their jurisdictions, fearing that defunct farms would create unemployment and possibly food security problems, they have probably not used their power over farms much to the latter's disadvantage.

Because the relationship between farms and local governments in Central and Eastern Europe is weaker than in NIS countries, CEEC farms might be more vulnerable to input suppliers with market power. However, evidence indicates that processors in CEECs do not have strong market power, with food processing being even less concentrated than in Western Europe. For example, the top four flour processors in the Czech Republic, Hungary, Poland, and Romania have less market power than their counterparts in France, Germany, or the United Kingdom (Gorton et al., 2000).

It therefore appears that most of the worsening in agricultural producers' terms of trade during transition resulted not from the abuse of market power by input suppliers, but rather from correction of the price-cost disparity for goods in the pre-reform period. If so, the worsening of producers' terms of trade with price liberalization is evidence of the degree to which the pre-reform price system helped subsidize agricultural production.

Trade Liberalization

The second major reform policy that affected commodity restructuring in agriculture was trade liberalization. Assume in figure 4 that the world price for the good in question is P^2 , compared with the domestic price after price liberalization but before trade liberalization of P^4 . If the country allows free trade in the good and internal markets are functioning well, the world price will determine the domestic price. The domestic price will therefore drop to P^2 . Production will fall from Q^2 to Q^1 , consumption will rise from Q^2 to Q^4 , and the country will import Q^1Q^4 of the good. (In figure 4, Q^4 is used to represent the quantity of consumption after price and trade liberalization, associated with point I, as well as the quantity of production and consumption after price liberalization within this market alone, associated with point C. These two quantities would usually be different, but again are made equal simply to avoid cluttering the figure.)

When transition economies liberalized trade, world market prices for agricultural goods were typically below rather than above domestic prices (the empirical evidence is discussed later in the section that examines why forecasting studies underestimated the output drop during transition). Setting domestic producer prices above world trade prices was the third way by which the pre-reform system subsidized agriculture. For certain countries and goods, though, world prices were above domestic prices. This means that with trade liberalization, domestic prices rose to world levels, and pre-reform production was taxed rather than subsidized relative to the world market. One could easily use figure 4 to show that in this case the (isolated) effect of trade liberalization would be increased production, decreased consumption, and increased exports of the good. Transition economies that currently are net exporters of agricultural commodities include Poland and Hungary with pork, Hungary and Romania with grain, and Uzbekistan and Turkmenistan with cotton.

The pre-reform scenario depicted in figure 1 assumes that the country is not trading any of the good in question. However, the pre-reform transition economies did engage in agricultural trade. Most of their agricultural exports went to other states within the Soviet bloc, particularly Russia. (For the countries of the former USSR, these “exports” were part of inter-republic flows.) Examples include exports of meat by Hungary, Romania, Ukraine and Kazakstan; grain by Hungary, Ukraine, and Kazakstan; sugar by Ukraine; and cotton by Uzbekistan and Turkmenistan.

The pre-reform trade in agriculture was not market-driven but rather was an integral part of countries’ economic planning. As a result, the collapse of the Soviet bloc and central planning abruptly reduced the commodity flows. Because these exports were generally lower in quality than corresponding output sold on the world market, alternative foreign markets could not necessarily be found. The loss of markets within the former Soviet bloc reinforced the drop in demand from falling domestic consumer income. This effect caused the demand curve for such products to shift even further to the left.⁸ Over time, some CEECs have expanded their agricultural exports to the European Union. For certain CEECs, such as Poland and Hungary, this export growth has more than compensated for the loss of export markets in other transition economies. By the late 1990s, their total agricultural exports in value terms exceeded pre-reform levels.⁹

The USSR was also a major agricultural importer of products from outside the Soviet bloc (with most of the imports again going to Russia). The main imports included feed grain, soybeans, and soybean meal, needed to feed the growing livestock herds.¹⁰ The reform-driven contraction of the livestock sector has severely reduced these imports (table 3). Instead of importing feed to support their expensively maintained livestock herds, the countries of the former USSR (again mainly Russia) are importing meat and other livestock products directly. From the second half of the 1980s to the period 1995-98, average annual meat imports by the countries of the former USSR rose by about 125 percent.¹¹

⁸ In the pre-reform scenario depicted in figure 1, exports would result in a new demand curve, called D^3 , which lay to the right of, and parallel to, D^1 . The horizontal distance between the two demand curves would equal the level of exports. Loss of this trade would shift the operative demand curve from D^3 to D^1 .

⁹ For further discussion of the effects of reform on the agricultural trade of the CEECs, in particular their growing trade with the EU, see ERS (1993) and ERS (1999a).

¹⁰ This point takes issue with the criticism often made of the former USSR that it could not even feed itself. Rather than allaying food shortages, the imports of animal feed were used to maintain artificially high levels of livestock production and consumption.

¹¹ The reason the data in table 3 stop at 1998 is that in 1999 and 2000 the United States and EU gave Russia substantial food aid. The official Russian foreign trade data do not distinguish between commercial imports and food aid, and separating out the two categories of inflows would be overly difficult.

The NIS region's switch from being a major importer of animal feed to a major importer of meat and other live-stock products suggests that the region has a *comparative disadvantage* in the production of livestock products relative to animal feed; that is, the region produces meat and other livestock products at a higher cost than it produces animal feed, relative to world market prices. Liefert (1994) supports this conclusion. He finds that at the end of the Soviet period, the USSR had a comparative disadvantage in meat production compared with grain production. That agricultural trade during the Soviet period appears to have been inconsistent with comparative advantage shows the extent to which trade was driven by policy rather than economic rationality. Liefert (forthcoming) shows that in the late 1990s, Russia continued to have a comparative disadvantage in meat production compared with grain production.

In the pre-reform period, the United States was a major exporter of grain, soybeans, and soybean meal to the former USSR. In the wake of the changes in NIS agricultural trade, U.S. exports of all these products to the region have fallen substantially. However, the United States has moved from exporting almost no meat to the region in the pre-reform period to being a major meat exporter. The bulk of the exports are poultry, going mostly to Russia. In fact, during the second half of the 1990s, Russia took nearly half of all U.S. poultry exports. Because the changes in NIS agricultural trade are being driven by the economic fundamentals of comparative advantage, rather than any short-run "disruptions" of transition, the changes in the volume and structure of U.S. agricultural exports to the NIS region are not likely to be reversed in the foreseeable future.

Why Price and Trade Liberalization Reduced Agricultural Output

Price and trade liberalization substantially changed prices and incomes—the two main factors on which producers and consumers base their decisions to produce, buy, and sell goods. Changes in these variables in turn induced major changes in agricultural production, consumption, and trade. The decline in output, particularly in the livestock sector, was inevitable. Price liberalization caused output for a typical good to fall for three reasons—liberalization and elimination of budget subsidies within that market alone, the drop in consumer income, and the rise in inputs' real prices, with the last two effects occurring from economy-wide price liberalization. Trade liberalization added a fourth reason production could drop—world prices lying below domestic producer prices.

Another way to explain why economic reform has reduced agricultural output is to identify how the pre-reform system directly and indirectly subsidized agriculture, and how the elimination of these subsidies through price and trade liberalization caused production to drop. The three main types of subsidies were direct budget subsidies from the government, the domestic price system that kept prices for agricultural inputs low relative to producer output prices and the real costs of production, and the price and trade system that kept producer prices above world trade prices.

Certain "transition economies" have experienced no drop in aggregate agricultural output during the 1990s. In Uzbekistan, total production has not fallen, and in Turkmenistan, it has increased (table 1). However, the absence of a decline in output for such countries reflects failure to reform, rather than reform success. These countries have been the least reformist, not only in agriculture but economy-wide, with the state retaining strong control over agriculture. In fact, in the World Bank grading of agricultural reform progress among the transition economies, Uzbekistan and Turkmenistan (along with Belarus) are at the bottom of the list. However, major changes have occurred in these two countries' commodity composition of output. Their main agricultural policy since the Soviet Union broke up has been to move away from heavily pushing cotton production to producing more foodstuffs, in particular grain. This explains why in table 1 grain output in Uzbekistan and Turkmenistan during the 1990s more than doubled and tripled, respectively.

Because the decline in agricultural output (in most transition economies) has been a necessary consequence of market liberalization, the change in output is a misleading indicator of the success of agricultural reform. The degree to which output has fallen in individual countries is largely a measure of the extent to which in the pre-reform period agriculture was subsidized, planners' preferences for goods deviated from consumers' preferences, and the structure of countries' production and foreign trade differed from that based on comparative advantage.¹²

¹² Although examining why industrial output has also fallen during the transition period is beyond the scope of this report, the general reasons are the same as those given for agriculture. Planners' desires for goods dominated those of consumers, industrial production was subsidized (especially in heavy industry, such as metallurgy and chemicals), and production and trade were not driven by countries' comparative advantage vis-à-vis the world market. Thus, industry was also an overexpanded sector of the economy.

High Transaction Costs Resulting From Undeveloped Market Infrastructure

Liberalization policies hit agricultural markets fast and hard during the early reform years. A more protracted reason for the decline in agricultural output has been deficient market infrastructure, both physical and institutional. Poor infrastructure increases farms' costs and risks of producing and, in particular, selling output—that is, it raises the transaction costs of doing business. Although undeveloped physical and commercial infrastructure can also be a difficulty for industry, it is particularly problematic for agriculture, largely because of the perishability of foodstuffs.

Just as an increase in the cost of inputs shifts the producers' supply curve to the left, so also does an increase in transaction costs. In figure 4, high transaction costs would be represented by shifting the supply curve S^2 further to the left. With the world price of P^2 setting the domestic price, the leftward shift in supply would cause production to fall below Q^1 .

All the transition economies inherited from the pre-reform period poor systems of physical infrastructure. Although storage capacity is inadequate, the main weakness is transportation, particularly the poor road system. In some countries, the cost of shipping agricultural commodities between regions exceeds producer prices. In addition, the deficient transportation and storage systems increase the risk of spoilage.

Transition economies also undertook reform without the benefit of established market infrastructure. The pre-reform planned system did not need, and therefore did not provide, the type of commercial and institutional infrastructure that a market-oriented agricultural economy requires. Producers and, especially, traders need a financial system that allows fast, affordable access to capital, a system for quick and inexpensive dissemination of market information (where can one buy and sell, and at what price?), and a strong system of commercial law that protects property and enforces contracts. The absence of this market infrastructure increases the risks and transaction costs of doing business.

An endemic problem in these economies that raises transaction costs is extortion and bribery, a consequence largely of the dysfunctional legal system. The problem is particularly serious for sellers of agricultural products. The easily identifiable and spoilable

nature of their output makes them vulnerable to vandalism by extortionists or corrupt officials.

Producers must compete, especially vis-à-vis imports, with respect to all aspects of their operations—sales as well as primary production. High transaction costs, particularly in NIS countries, make it difficult for domestic producers in outlying regions to compete with food imports. The large agricultural imports of the Soviet period led to the creation of a relatively well-functioning and inexpensive system for moving imports from entry ports to high-consuming urban areas, such as Moscow and St. Petersburg (which itself is a port).

These transaction costs can be roughly measured by comparing producer prices for agricultural commodities within countries with world prices. Often, producer prices have been far below world trade prices, which under normal market conditions would result in the countries' exporting the products. However, the goods in question often were not exported, and in many cases countries imported the products. High transaction costs precluded export; that is, if transaction costs were added to the costs of production, the total cost would make the goods uncompetitive on the world market or with imports.

For example, in the first half of the 1990s, producer prices for all agricultural commodities in Russia were far below world prices, which were two to four times greater than Russian producer prices (Liefert et al., 1996). Yet, Russia was not a net exporter of any major agricultural goods, and for a number of products it was in fact a net importer.

The economic crisis that hit Russia in August 1998, and agriculture's response to it, provides further evidence of the harmful effect of high transaction costs on agriculture. As a result of the crisis, the ruble depreciated against Western currencies by as much as 80 percent. The depreciation substantially raised the domestic currency prices of imports, such that imports fell significantly. In 1999, agricultural imports dropped by about half. This hurt U.S. agricultural exports to Russia, especially of poultry, as well as exports by various transition economies to Russia, such as Polish pork.

By raising the price competitiveness of all domestic output vis-à-vis imports and the world market, the currency depreciation provided an excellent opportunity

Measuring the Causes of Output Decline

An empirical study by Macours and Swinnen (2000a) on the causes of agricultural output decline in transition economies strongly supports this ERS report's analysis of why agricultural production has fallen. This report argues that the drop in agricultural output has resulted mainly from the policies of market liberalization—price and trade liberalization and reduction of subsidies. According to Macours and Swinnen, market liberalization policies account for about three-quarters of the output decline in their study.

The Macours and Swinnen (M&S) study covers the output of five crops (wheat, corn, barley, sugar, and oilseeds) in eight CEECs during 1989-95. The eight countries are Albania, Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovak Republic, and Slovenia.

The study econometrically measures the contribution of various reform policies and developments to the production drop (see table). *Uncertainty* hurts output because it motivates farmers to reduce input use. *Disruption* from farm restructuring lowers output because of temporary inefficiencies, such as upsetting contractual relations and poor initial allocations on farms of the key inputs of land, labor, and capital. *Individual farms* is the only variable in the study found to increase output, as the move from large collective farms to small individual ones improves the incentives to use labor and other inputs more productively.

The two explanatory variables in M&S that capture the output effects from market liberalization are *price changes* and *privatization*. *Price changes* covers changes in agricultural output prices relative to changes in input prices (that is, producers' terms of trade) that result from price and trade liberalization. Because the analysis of the drop in output as presented in this report using figures 1 and 4 focuses on how price and trade liberalization changes prices, the fall in output attributed to the variable *price changes* in M&S corresponds to most of the output decline as identified in this ERS report. M&S find that price changes account for 46 percent of the drop in output.

Causes of crop output decline

Variable	Contribution to net output change
	Percent
Weather	-10
Uncertainty	-12
Farm restructuring	+18
Disruption	-50
Individual farms	+68
Privatization	-39
Price changes	-46
Residual	-11
Total output change	-100

Source: Macours and Swinnen (2000a).

Privatization measures the share of privately owned land. The move to privatization can have two opposite effects on output. The positive effect is that like individual farming, privatization can improve incentives to use inputs more productively, thereby increasing production. The negative effect is that privatization imposes a "hard budget constraint," which means that farms must become self-financing rather than dependent on the state for various subsidies. The drop in subsidies reduces input use, which lowers output. M&S find that privatization is responsible for 39 percent of the net fall in production. This finding shows that the negative hard budget constraint impact on output from privatization heavily dominates the positive efficiency effect. However, M&S point out that privatization encourages underreporting of output by farms, both to reduce taxation and to strengthen farms' arguments that they need more state support. The likelihood of underreporting means that privatization might account for somewhat less than the 39 percent of the drop in production calculated by M&S.

As mentioned in the previous paragraph, privatization decreases output by reducing subsidies to farms. In figure 1, the pre-reform producer price P^5 is the producer incentive price, which equals the actual price received plus per unit subsidies. The negative

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effect on output because of privatization in M&S would be captured in figure 1 by the fall in production from Q⁵ to Q⁴. The examination of the fall in agricultural production in this ERS report therefore covers the output effects from both changes in prices and privatization as defined and measured by M&S. These two variables in the M&S study together explain 85 percent of the drop in output, though the number should be reduced somewhat because of the incentives for farms under privatization to switch from overreporting to underreporting output. Thus, the policies of market liberalization—liberalizing

prices and trade and reducing subsidies—probably account for about three-quarters of the reform-driven drop in agricultural output in the M&S study.

The one major cause of agricultural output decline examined in this ERS report that M&S do not measure is high transaction costs resulting from undeveloped market infrastructure. The explanatory variable in M&S probably closest to this factor is *uncertainty*. In M&S, 11 percent of the output decline cannot be explained by the variables identified. This residual 11 percent could therefore capture the output decline from undeveloped market infrastructure.

to stimulate Russian agricultural production. However, it appears that agriculture has responded only mildly. Although total agricultural output in Russia increased in 1999 and 2000 by 3 and 5 percent, this was mainly because weather improved in these years compared with the terrible weather year of 1998 (which produced Russia's lowest grain harvest in decades). In 2000, total agricultural production was still 4 percent lower than in 1997 (admittedly a very good weather year).

The change in Russia's production of livestock goods is a better indicator of the response to ruble depreciation than the change in crop production, given that Russia imports more livestock products than crops (in value terms), and that livestock output is not as vulnerable to the weather. In 1999 livestock production declined 4 percent, while aggregate output in 2000 was unchanged. The 2000 performance, in fact, represents some progress, because it was the first year since reform began that livestock output did not fall. Other positive indicators in 2000 were the marginal

improvement in farm profitability (the number of unprofitable farms fell from 54 to 48 percent), and the rise in output of agricultural inputs (Serova, 2001). This evidence supports the conclusion that the isolated effect of major ruble depreciation on agricultural output has been positive, though hardly robust.

Ruble depreciation should stimulate domestic production by raising the domestic ruble prices of agricultural goods that compete with imports. The actual modest output response suggests that transmission between changes in the exchange rate and changes in domestic agricultural prices is not strong. Osborne and Liefert (2001) calculate that transmission between changes in the exchange rate and retail food prices in Russia is fairly weak. The most likely reason for low price transmission is high transaction costs due to deficient physical and institutional infrastructure, which work to segment regional markets within the country from each other as well as isolate these regional markets from the world market.